

Patent Claims

What is claimed is:

1. A device for positioning of a moving object having a monitoring system and a transponder, attachable to the moving object, which includes an infrared receiver and an ultrasound transmitter, the monitoring system having an analysis unit and at least two sensor units, which are connectable to the analysis unit and include an infrared transmitter and an ultrasound receiver, an infrared trigger signal (IR-TC) able to be emitted, which triggers the emission of an ultrasound signal (US) by the ultrasound transmitter, the ultrasound signal (US) being receivable by the ultrasound receivers and the positioning of the moving object able to be performed by the analysis unit using travel time determination of the ultrasound signal (US).
2. The device for positioning according to Claim 1, characterized in that the positioning of the moving object is performed in a monitorable region.
3. The device for positioning according to Claim 1, characterized in that the monitoring system is laid out in such a way that a start signal (S-TC) transmitted from the analysis unit (1) to the sensor units causes the emission of the infrared trigger signal (IR-TC) by at least one of the infrared transmitters, the infrared trigger signal (IR-TC) being receivable by the infrared receiver.
4. The device for positioning according to Claim 3, characterized in that the sensor units trigger stop signals (S-US) as a reaction to the received ultrasound signal (US), which may be transmitted by the sensor units to the analysis unit in such a way that time differences between a start signal (S-TC), which triggers the emission of the infrared trigger signal (IR-TC), and the stop signals (S-US) are analyzed for the positioning of the transponder.

5. The device for positioning according to Claim 1, 3, or 4, characterized in that multiple moving objects, each having a transponder attached to the object, are provided in the monitoring space.
6. The device for positioning according to Claim 1 or 4, characterized in that the analysis unit includes at least one control unit, a computing unit, a visualization unit, and a radio receiver, the at least one control unit being connectable to the computing unit, the computing unit being connectable to the visualization unit, and the radio receiver being connectable to the computing unit.
7. The device for positioning according to Claim 6, characterized in that the transponder includes a radio transmitter for transmitting an object identification number (IDx), the radio transmitter being wirelessly connectable to the radio receiver.
8. The device for positioning according to Claim 6, characterized in that the at least one control unit is provided as at least one plug-in module in the computing unit.
9. The device for positioning according to Claim 6, characterized in that connections (SS) between the sensor units and the analysis unit are wireless connections or wire-bound connections.

10. A method of positioning a moving object, using a transponder attachable to the moving object and a monitoring system having at least two sensor units, including the following method steps:
 - emission of an infrared signal (IR-TC) by at least one of the two sensor units as a reaction to a start signal (S-TC);
 - transmission of an ultrasound signal (US) using an ultrasound transmitter, which is part of the transponder, as a reaction to the infrared trigger signal (IR-TC);
 - transmission of a stop signal (S-US) by each of the two sensor units to a control unit as a reaction to the received ultrasound signal (US);
 - determination of the time differences between the start signal (S-TC) and the stop signals (S-US) by the control unit;
 - conversion of the time differences into distance values (Dx) between the transponder and the sensor units, the distance values (Dx) corresponding to the travel times of the ultrasound signal (US); and
 - determination of the position of the moving object.
11. The method of positioning according to Claim 10, characterized in that the infrared trigger signal (IR-TC) includes a command code for transmitting the ultrasound signal (US) and/or an object identification number (IDx), the object identification number (IDx) preferably being selected from a list.
12. The method of positioning according to Claim 11, characterized in that the transponder compares the object identification number (IDx) received through the infrared trigger signal (IR-TC) to its own object identification number, the ultrasound signal (US) being emitted only if the object identification numbers correspond.

13. The method of positioning according to Claim 11, characterized in that the list is generated by the following method steps:
- the control unit emits search signals (S-IC) to the sensor units,
 - an IR transmitter of at least one of the at least two sensor units emits an infrared search signal (IR-IC) as a reaction,
 - the infrared search signal (IR-IC) is received by one or more IR receivers, which are part of one or more transponders,
 - one or more radio transmitters, which are part of one or more transponders, transmit a radio signal (HF-ID) having the corresponding object identification number (IDx) to a radio receiver as a reaction,
 - the object identification numbers (IDx) received are entered into the list.
14. The method according to Claim 10, characterized in that the distance values (Dx) are differentiated by a computing unit into real distance values, obtained through direct sight connection between transponder and sensor units, and unreal distance values, obtained through reflections, only real distance values being processed further by the computing unit.
15. The method according to Claim 14, characterized in that the real distance values (Dx) obtained are used to calculate the position in a coordinate system, from multiple positions obtained, those having the smallest distance to the last known position being selected and transmitted to the visualization unit for representation.